

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

APPLICANT: Bret Ja Chisholm)
) Group Art Unit: 1754
SERIAL NO.: 10/652,812)
)
FILED: 8/29/2003)
) Examiner: Timothy C. Vanoy
FOR: METAL OXIDE NANOPARTICLES,)
METHODS OF MAKING, AND)
METHODS OF USE)

VIA ELECTRONIC SUBMISSION
Commissioner for Patents
Alexandria, VA 22313

RESPONSE TO RESTRICTION REQUIREMENT

Sir:

This Response is submitted in view of the Restriction Requirement dated January 19, 2006.

CLAIMS:

1. (Original) A method of making metal oxide nanoparticles, comprising:

hydrolyzing metal alkoxide with an acidic alcohol solution, wherein the acidic alcohol solution comprises an alkyl alcohol, water, and an acid to form a first sol comprising metal oxide nanoparticles;

treating the first sol with an organosilane to form a second sol comprising treated metal oxide nanoparticles; and

treating the second sol with an organic base in an amount of about 0.1:1 to about 0.9:1 molar ratio of organic base to acid to form a third sol comprising treated metal oxide nanoparticles.
2. (Original) The method of claim 1, wherein the metal is titanium, cerium, zirconium, or tin; and the alkoxide is a linear or branched C₁-C₁₂ alkoxide.
3. (Original) The method of claim 1, wherein the acid is present in an amount of about 0.1:1 to about 2:1 molar ratio of acid to metal alkoxide.
4. (Original) The method of claim 1, wherein the water is present in an amount of about 0.1:1 to about 5:1 molar ratio of water to metal alkoxide.
5. (Original) The method of claim 1, wherein the organosilane is an alkoxyorganosilane, an aryloxyorganosilane, an arylalkoxyorganosilane, an arlyalkylalkoxyorganosilane, an alkylaminoorganosilane, or a combination comprising at least one of the foregoing organosilanes.
6. (Original) The method of claim 1, wherein the organosilane lacks groups reactive with a polymerizable compound.
7. (Original) The method of claim 1, wherein the organosilane is in an amount of about 1:1 to about 1:10 molar ratio of metal alkoxide to organosilane.

8. (Original) The method of claim 1, wherein the organic base is a linear or branched chain C₁-C₁₂ alkylamine.

9. (Original) The method of claim 1, wherein the second sol is formed at a temperature of about 25°C to about 100°C for about 8 hours.

10. (Original) The method of claim 1, further comprising combining a polymerizable compound with the third sol to form a mixture; and removing solvent from the mixture to form a polymerizable composition.

11. (Original) The method of claim 10, wherein the polymerizable composition exhibits a yellowness index of less than about 30 as measured by ASTM D1925 using a path length of 1 mm.

12. (Original) The method of claim 10, further comprising combining an initiator with the third sol.

13. (Withdrawn) An article prepared from curing the polymerizable composition of claim 10.

14. (Withdrawn) An optical article or light management film prepared from curing the polymerizable composition of claim 10.

15. (Original) A method of making titanium oxide nanoparticles, comprising:

hydrolyzing titanium tetraalkoxide with an acidic alcohol solution to form a first sol comprising titanium oxide nanoparticles, wherein the acidic alcohol solution comprises

an alkyl alcohol,

water in an amount of about 0.1:1 to about 5:1 molar ratio of water to titanium tetraalkoxide, and

an acid in an amount of about 0.1:1 to about 2:1 molar ratio of acid to titanium tetraalkoxide;

treating the first sol with an organosilane to form a second sol comprising treated titanium oxide nanoparticles; and

treating the second sol with an organic base in an amount of about 0.1:1 to about 0.9:1 molar ratio of organic base to acid to form a third sol comprising treated titanium oxide nanoparticles.

16. (Original) The method of claim 15, further comprising combining a polymerizable compound with the third sol to form a mixture; and removing solvent from the mixture to form a polymerizable composition.

17. (Original) The method of claim 16, wherein the polymerizable composition exhibits a yellowness index of less than about 30 as measured by ASTM D1925 using a path length of 1 mm.

18. (Withdrawn) An article prepared from curing the polymerizable composition of claim 16.

19. (Withdrawn) A composition, comprising:

a polymerizable compound; and

treated titanium oxide nanoparticles, wherein the treated titanium oxide nanoparticles are prepared by hydrolyzing titanium tetraalkoxide with an acidic alcohol solution to form a first sol, wherein the acidic alcohol solution comprises

an alkyl alcohol,

water in an amount of about 0.1:1 to about 5:1 molar ratio of water to titanium tetraalkoxide, and

an acid in an amount of about 0.1:1 to about 2:1 molar ratio of acid to titanium tetraalkoxide;

treating the first sol with an organosilane to form a second sol; and

treating the second sol with an organic base in an amount of about 0.1:1 to about 0.9:1 molar ratio of organic base to acid to form a third sol comprising treated titanium oxide nanoparticles.

REMARKS

Claims 1-19 are pending in the present Application, claims 13-14 and 18-19 have been withdrawn.

Response to Restriction Requirement

The Examiner has restricted the claims according to the following groups:

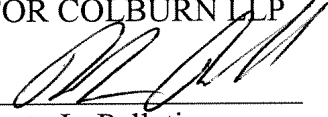
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|-----------|--|
| Group I | Claims 1-12 and 15-17, drawn to a method for making metal oxide particles, classified in Class 423, subclass 592.1+. |
| Group II | Claim 13, drawn to an article, classified in Class unknown, subclass unknown. |
| Group III | Claim 14, drawn to an optical article, classified in Class 359, subclass 642+. |
| Group IV | Claim 18, drawn to an article, classified in Class unknown, subclass unknown. |
| Group V | Claim 19, drawn to a composition comprising a polymerizable compound and titanium oxide nanoparticles, classified in Class 359, subclass 1+. |

In response to the Examiner's request, the Applicant hereby elects with traverse to prosecute Group I, claims 1-12 and 15-17, drawn to a method for making metal oxide particles.

If there are any charges with respect to this Restriction Requirement, or otherwise, please charge them to Deposit Account No. 07-0868.

Respectfully submitted,

CANTOR COLBURN LLP

By 
Roberta L. Pelletier
Registration No. 46,372
Yong Zhao
Registration No. 57,014
Customer No. 23413

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CANTOR COLBURN LLP
55 Griffin Road South
Bloomfield, CT 06002
Telephone (860) 286-2929
Facsimile (860) 286-0115
Customer No.: 23413